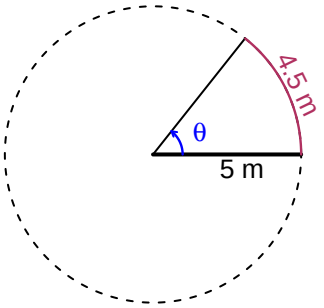
Name: Date:

Trig Final (Solution v9)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 5 meters. The arc length is 4.5 meters. What is the angle measure in radians?

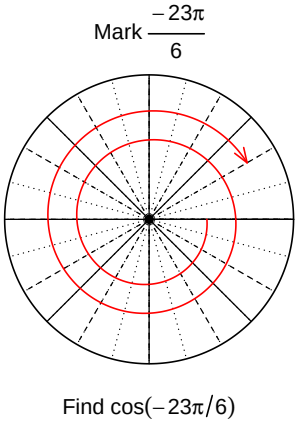


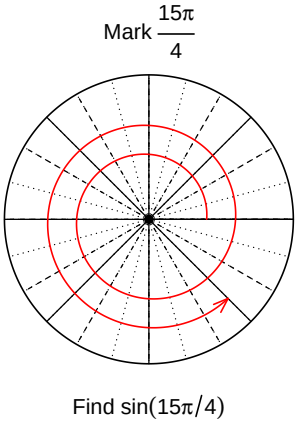
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 0.9$ radians.

Question 2

Consider angles $\frac{-23\pi}{6}$ and $\frac{15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-23\pi}{6}\right)$ and $\sin\left(\frac{15\pi}{4}\right)$ by using a unit circle (provided separately).





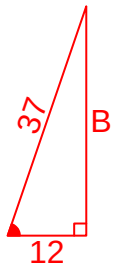
$\cos(-23\pi/6) = \frac{\sqrt{3}}{2}$

$\sin(15\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-12}{37}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

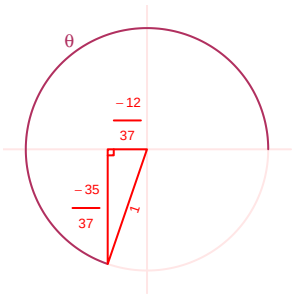
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$12^2 + B^2 = 37^2$$
$$B = \sqrt{37^2 - 12^2}$$
$$B = 35$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-35}{37}}{\frac{-12}{37}} = \frac{35}{12}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -5.28$ meters, a frequency of 8.81 Hz, and an amplitude of 3.4 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.4\cos(2\pi 8.81t) - 5.28$$

or

$$y = 3.4\cos(17.62\pi t) - 5.28$$

or

$$y = 3.4\cos(55.35t) - 5.28$$